

Processing and Its Techniques in Vegetable Crops

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Abstract

Vegetable processing is a critical step in the production and supply chain, transforming raw crops into consumable products while preserving their nutritional value. In India about 20-40% of total horticulture produce wasted due to lack of post-harvest management of vegetables which resulted in huge financial loss. Most poor horticulture producers cannot meet the expense of modern technologies. Many metabolic changes occur in vegetables after harvesting that are influenced by disruption of supply of nutrients, water and growth regulators from the parent plant to the harvested vegetables. The overall process leads to postharvest deterioration of the produce. However, the losses are often reduced with adoption of postharvest management and use of processing technology of vegetable crops. This article highlights the importance of processing in vegetable crops, discussing various techniques employed to enhance quality, safety and shelf life.

Introduction

India is the second-largest producer of vegetables in the world next only to China and accounts for about 15 percent of the world production of vegetables. As per National Horticulture Database (2nd Advance Estimates) published by National Horticulture Board, during 2023-24, India produced 204.96 million metric tonnes of vegetables. They provide vital nutrients for health and maintenance of our body. Regular consumption of vegetables provides nutrition and health benefits – people who eat more vegetables as part of an overall healthy diet are likely to have a reduced risk of some chronic diseases. According to FAO, 70% increase in food production is needed to make the food available to the world population which will reach 9 billion by 2050. Huge amounts of food are lost every year worldwide due post-harvest damages caused due to physical factors (mechanical injuries), physiological factors (Wilting, shriveling, chilling injury) or some pathological factor (decay due to fungi or bacteria). These causes in many instances are interrelated i.e. mechanical injury may promote the chances of post-harvest decay in most of the cases. Post-harvest losses are approximately 20-50% in developing countries and 10-15% in developed countries (Pankaj *et.al.*2019). The

processed vegetables comprised of including of pulses Rs. 14,339.94Crore/ USD 1,730.79million in 2023-2024 (APEDA, 2023).

Processing industry of horticulture crops including vegetable crops is a very backbone of horticulture industry taking care of gluts and wastes. Processing can fetch an additional income to the grower, s and helps in stabilizing the prices with economic returns. The best indicator of the economic contribution of food processing to the food system is the value addition. Value addition is the indicator of the industry, s contribution to GDP (Kaur and Kaur, 2022). Postharvest loss in quality as well as quantity of fruits and vegetables is huge due to seasonal production, high perishability, shorter shelf life and preservation through processing is one of the best methods to minimize the loss. (Archana *et. al* 2020).

Importance of Processing in Vegetable crops

Processing plays a crucial role in vegetable crops, offering numerous benefits, including:

1. **Extended shelf life:** Processing helps preserve vegetables, reducing spoilage and food waste.
2. **Year-round availability:** Processed vegetable can be stored and consumed throughout the year, regardless of the crop's natural seasonality.
3. **Improved safety:** Processing eliminates pathogens and contaminants, ensuring consumer safety.
4. **Enhanced quality:** Processing can improve texture, colour and flavour making vegetables more appealing to consumers
5. **Increased convenience:** Processed vegetables are often pre-washed, pre-cut and ready-to-use, saving time for consumers.
6. **Value addition:** Processing creates new products and increases the economic value of vegetable crops
7. **Nutrition retention:** Proper processing helps retain nutrients and bioactive compounds in vegetables
8. **Market expansion:** Processed vegetables can be exported, expanding market opportunities for farmers.
9. **Food security:** Processing helps ensure a steady supply of vegetables, contributing to food security

10. **Reduced waste:** Processing can utilize imperfect or surplus produce, reducing food waste.
11. **Economic benefits:** Processing creates employment opportunities and generates income for farmers and processors
12. **Improved trade:** Processed vegetables can be traded globally, boosting international trade.

Processing plays a vital role in enhancing the quality, safety and value of vegetable crops, making them more accessible and convenient for consumers while supporting sustainable agriculture and food systems.

Processing techniques in vegetable crops

Vegetable processing refers to the various techniques and methods used to transform raw vegetables into consumable products, enhancing their quality, safety and shelf life. Processing involves a series of Physical, chemical and biological changes that help preserve vegetables, maintain their nutritional value and create value-added products.

Here are some common processing techniques used in vegetable crops are:

- ❖ **Washing and Cleaning:** Removes dirt, debris and microorganisms
- ❖ **Sorting and grading:** Separates vegetables by size, color and quality
- ❖ **Trimming and cutting:** Removes leaves, stems and other unwanted parts
- ❖ **Peeling:** Removes skin or outer layers.
- ❖ **Slicing, dicing and chopping:** Cuts vegetables into desired shapes and sizes
- ❖ **Blanching:** Briefly boils or steams to inactivate enzymes and preserve color.
- ❖ **Freezing:** Preserves vegetables by freezing
- ❖ **Canning:** Packs vegetables in airtight containers and heats to kill microorganisms
- ❖ **Dehydrating:** Removes moisture to preserve vegetables
- ❖ **Fermenting:** Allows vegetables to break down naturally by micro-organisms
- ❖ **Pickling:** Preserves vegetables in a brine solution
- ❖ **Juice extraction:** Extracts juice from vegetables
- ❖ **Pureeing:** Blends vegetables into smooth paste
- ❖ **Heat treatment:** Applies heat to kill microorganisms and extend shelf life

- ❖ **Vacuum packaging:** Removes air to prevent spoilage and preserve freshness
- ❖ **Irradiation:** Uses radiation to kill microorganisms and extend shelf life
- ❖ **Modified atmosphere packaging:** Controls gas composition to preserve freshness
- ❖ **High-pressure processing:** Uses pressure to kill microorganisms and preserve quality

This processing techniques help enhance the quality, safety and shelf-life of vegetable crops making them more accessible and convenient for consumers.

Conclusion: Processing is a crucial step in the production and supply chain of vegetable crops, enhancing their quality, safety and shelf-life. Various processing techniques are employed to preserve vegetables, maintain their nutritional value and create value-added products. By adopting appropriate processing techniques, vegetable producers and processors can meet consumer demands ensure food security and contribute to the overall development of the horticultural sector. As the demand for processed vegetable products continues to grow, it is essential to invest in research and development, technology and infrastructure to improve processing efficiency, safety and sustainability.

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